

U. S. PARTICIPATION IN THE MARS EXPRESS MISSION

A. D. Morrison¹, T. W. Thompson², C. H. Acton, Jr.³, R. D. Bourke⁴, S. Butman⁵, J. K. Campbell⁶, P. L. Jepsen⁷,
W. T. K. Johnson⁸, S. K. Lavoie⁹, R. M. Metzger¹⁰, J. J. Plaut¹¹, and A. Vaisnys¹²

¹⁻¹²Jet Propulsion Laboratory, California Institute of Technology,
4800 Oak Grove Drive, Pasadena, California, USA 91109-8099

¹M/S 264-426, Andrew.D.Morrison@jpl.nasa.gov; ²M/S 300-227, Thomas.W.Thompson@jpl.nasa.gov;

³M/S 301-125L, Charles.H.Acton-Jr@jpl.nasa.gov; ⁴M/S 264-472, Roger.D.Bourke@jpl.nasa.gov;

⁵M/S 264-255, Stanley.Butman@jpl.nasa.gov; ⁶M/S 264-426, James.K.Campbell@jpl.nasa.gov;

⁷M/S 168-514, Paul.L.Jepsen@jpl.nasa.gov; ⁸M/S 233-202, Williamt.K.Johnson@jpl.nasa.gov;

⁹M/S 168-527, Susan.K.Lavoie@jpl.nasa.gov; ¹⁰M/S 156-223, Robert.M.Metzger@jpl.nasa.gov;

¹¹M/S 183-501, Jeffrey.J.Plaut@jpl.nasa.gov; ¹²M/S 161-260, Arvydas.Vaisnys@jpl.nasa.gov

Introduction: The Mars Express Mission is an international collaboration between the European Space Agency (ESA), the Italian Space Agency (ASI), and the National Aeronautics and Space Administration (NASA), as a supporting partner. The primary objective of the mission is to conduct a search for potential hydrologic resources from orbit and on the surface of Mars. Launch is anticipated to be from Russia during an 11-day launch window opening on June 1, 2003, with arrival at Mars in December 2003.

Mars Express Experiments: ESA selected eight experiments for Mars Express. Eleven U.S. proposers were selected by ESA as instrument Co-Investigators. NASA and ASI are jointly sponsoring an advanced radar sounder (MARSIS). Another selected instrument, ASPERA-3, is NASA-supported as a Discovery Mission of Opportunity; NASA is funding hardware development, data reduction, and archiving tasks for the instrument.

The Mars Express Mission experiments and sponsoring countries are:

- 1) ASPERA-3 (Analyzer of Space Plasma and Energetic Atoms), Sweden
- 2) HRSC (High Resolution Stereo Camera, Germany)
- 3) MARSIS (Mars Advanced Radar for Subsurface and Ionospheric Sounding), Italy/United States
- 4) OMEGA (Observatory of Mineralogy, Water, Ice, and Activity), France
- 5) PFS (Planetary Fourier Spectrometer), Italy
- 6) RSE (Radio Science Experiment), Germany
- 7) SPICAM (Spectroscopic Investigation of the Characteristics of the Atmosphere of Mars), France
- 8) Beagle 2 Lander — United Kingdom

U.S. Participation: U.S. participation in the Mars Express Mission comprises the Mars Express/NASA Project, managed by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology in Pasadena, California, and contribution to the

ASPERA-3 instrument through the Discovery Program, managed by the NASA Management Office, located at JPL in Pasadena. MARSIS activities, as well as various Mars Express supporting activities, including a Science Support task and a Relay Communications and Tracking Interoperability task, are coordinated through the Mars Express/NASA Project Office at JPL.

Mars Express/NASA Project. Objectives of the project are to:

- Provide the RF subsystem (integrated transmitter, antenna, and receiver) for MARSIS. Alenia Spazio (ALS) is responsible for the digital subsystem and instrument integration and test, under direction of the JPL Instrument Manager. The Co-Principal Investigator, from JPL, serves as the lead scientist for the NASA side of the experiment.

- Assist in achieving Mars Express instrument science objectives through U.S. Co-Investigator support.

- Support the HRSC with NASA/JPL image-processing software; deploy NASA's SPICE (Spacecraft, Planet, Instrument, C-matrix, Events) system; coordinate U.S. planning inputs to Mars Express Orbiter observations and secure support for Deep Space Network (DSN) tracking and navigation support for Mars orbit insertion; and archive science investigation data in a format compatible with the Planetary Data System (PDS) according to international agreements.

- Plan for provision of relay communications to/from Beagle 2 and potential European 2005 landers using NASA orbital assets.

NASA Discovery Mission of Opportunity. Two of ASPERA-3's four data-gathering sensors, the Electron Spectrometer (EIS) and the Ion Mass Analyzer (IMA), are funded by NASA. The instrument is being built by an international team of 15 groups from 10 countries. ASPERA-3 will address the question of how strongly interplanetary plasma and electromagnetic fields affect the Martian atmosphere, which is directly related to the many questions about water on Mars.